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1285 AVENUE OF THE AMERICAS
NEW YORK, NY 10019-6064

199, BOULEVARD SAINT-GERMAIN
75007 PARIS, FRANCE

AKASAKA TWIN TOWER
17-22, AKASAKA 2-CHOME
MINATO-KU, TOKYO 107, JAPAN

SUITE 1910 SCITE TOWER
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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

February 13, 1995

Mr. William Caton
Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: Ex Parte Notice
PR Docket No. 92-235

DOCKET FILE COPY ORIGINAL

Dear Mr. Caton:

On February 8-10, 1995, representatives of Nippon Telegraph and Telephone Corporation ("NTT") -- including Mr. Kazuyoshi Oshima, Dr. Kazuhiro Daikoku, Mr. Kazuo Imai of NTT; Steven Crowley and Robert Bednarek of Rubin, Bednarek & Associates; and Diane C. Gaylor, Paul J. Kollmer and the undersigned of Paul, Weiss, Rifkind, Wharton & Garrison -- met with the FCC staff members listed in Attachment A hereto for the purpose of demonstrating the operation of a prototype 5 kHz mobile radio unit incorporating RZ® SSB technology developed by NTT.*/

To demonstrate the capabilities of RZ® SSB technology, a base station featuring an RZ® SSB transmitter and a 3 element Yagi antenna were installed on the roof of 1350 Connecticut Ave, and a Dodge Ram van was fitted with whip antennas, an RZ® SSB receiver, and a variety of

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*/ Because of the ongoing nature of the demonstration and the need to accommodate last-minute changes by various FCC personnel scheduled to attend the demonstration, we have prepared the instant notice to encompass all relevant ex parte presentations that occurred during the demonstration within one document. To the extent necessary, we request a waiver of Section 1.1206(b)(2)'s "same day" filing requirement. Sec. 47 C.F.R. § 1.1206(b)(2).

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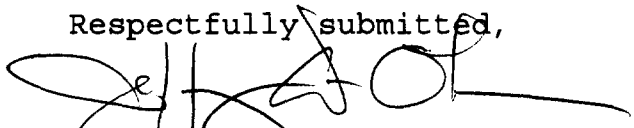
equipment designed to measure and illustrate system performance. The base station transmitted various test signals in a 5 kHz channel at a center frequency of 220.9825 MHz. The test signals were received in the van as it travelled around the Washington, D.C. area at various speeds. Participants riding in the van observed performance of the following tests:

- An analog voice signal was transmitted from the base station and received at the van.
- Multiple versions of two different test G3 facsimiles were transmitted from the base station at 9.6 kbps and received at a facsimile machine installed in the van.
- A 9.6 kbps data signal with 16-QAM was transmitted from the base station and received at the van. The quality of the received signal was analyzed using a bit error rate counter installed in the van.

Written materials distributed to attendees at the demonstration are included as Attachments B, C, and D respectively.

Respectfully submitted,



Jeffrey H. Olson

cc: Persons listed on Attachment A

A

ATTACHMENT A

NTT RZ SSB DEMONSTRATION

- FCC Attendees -

Name	Title/Division
Ralph Haller	Deputy Chief, Wireless Telecommunications Bureau
Laurence Atlas	Associate Chief, Wireless Telecommunications Bureau
Robert McNamara	Chief, Wireless Telecommunications Bureau, Private Radio Division
Kathryn Hosford	Assistant for Land Mobile & Public Safety Services
Jay Jackson	Engineering Advisor, Wireless Telecommunications Bureau, Commercial Radio Division
Michael Marcus	Associate Chief, Office of Engineering & Technology
Lawrence Petak	Chief, Office of Engineering & Technology, Spectrum Engineering Division
Julius Knapp	Chief, Office of Engineering & Technology, Authorization & Evaluation Division
F. Ronald Netro	Engineering Assistant, Wireless Telecommunications Bureau
Ira R. Keltz	Wireless Telecommunications Bureau
David Siddall	Legal Advisor, Office of Commissioner Ness
Rudy Baca	Legal Advisor, Office of Commissioner Quello

Richard M. Smith	Chief, Wireless Telecommunications Bureau
Herbert W. Zeiler	Deputy Chief, Wireless Telecommunications Bureau, Private Radio Division
Eugene Thomson	Wireless Telecommunications Bureau, Private Radio Division
Jennell Trigg	Intern, Office of Commissioner Chong
Courtney Bailey	Intern, Office of Commissioner Chong
Thomas Stanley	Office of Plans & Policy
Joseph Levin	Wireless Telecommunications Bureau
Mark Rubin	Wireless Telecommunications Bureau
Sonia Greenaway	Wireless Telecommunications Bureau
Donna Kanin	Wireless Telecommunications Bureau
Saul Shapiro	Office of Plans & Policy

B

LIVE DEMONSTRATION OF 5 kHz TECHNOLOGY

RZ® SSB MOBILE UNIT

DEVELOPED BY

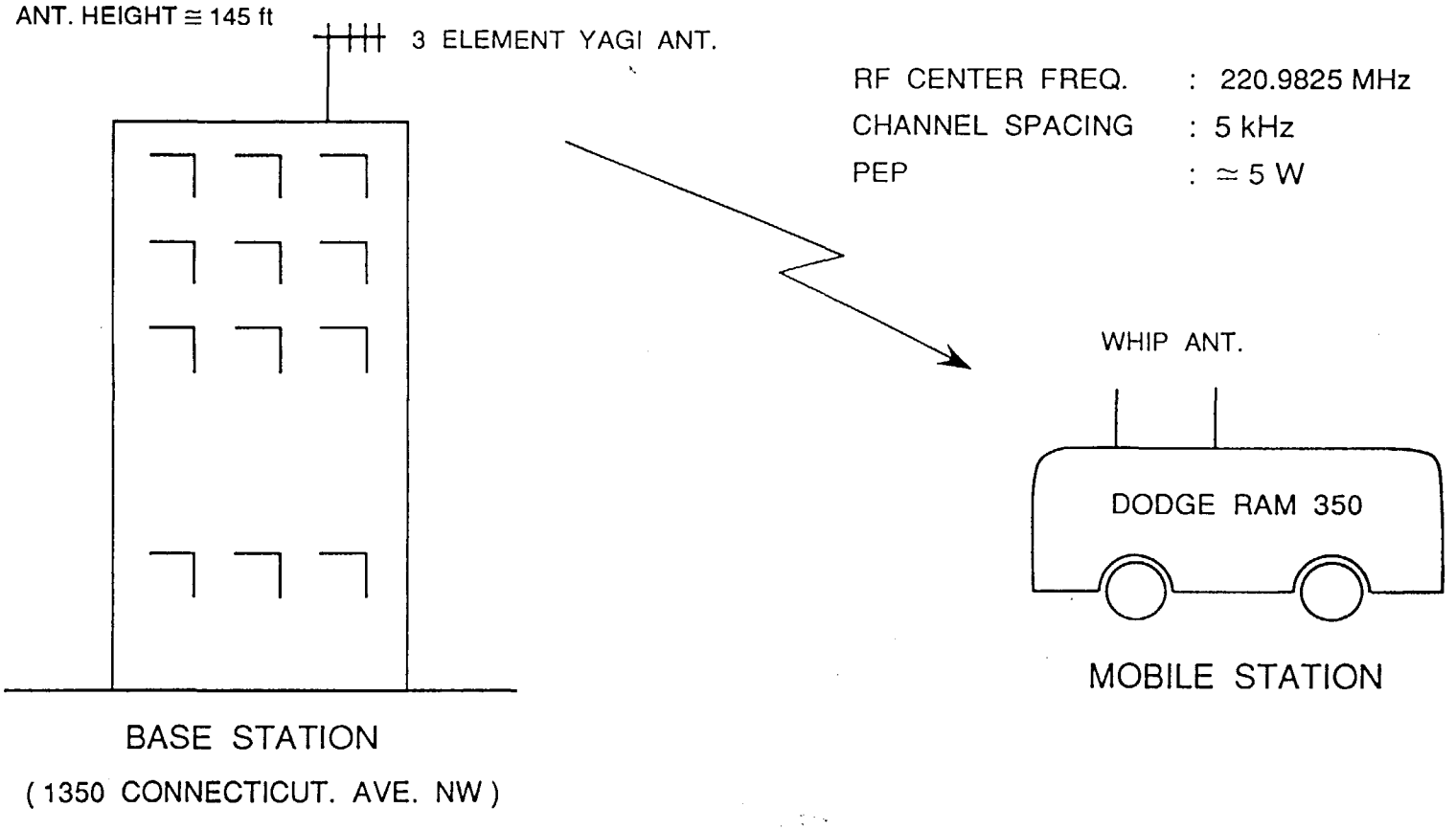
NTT

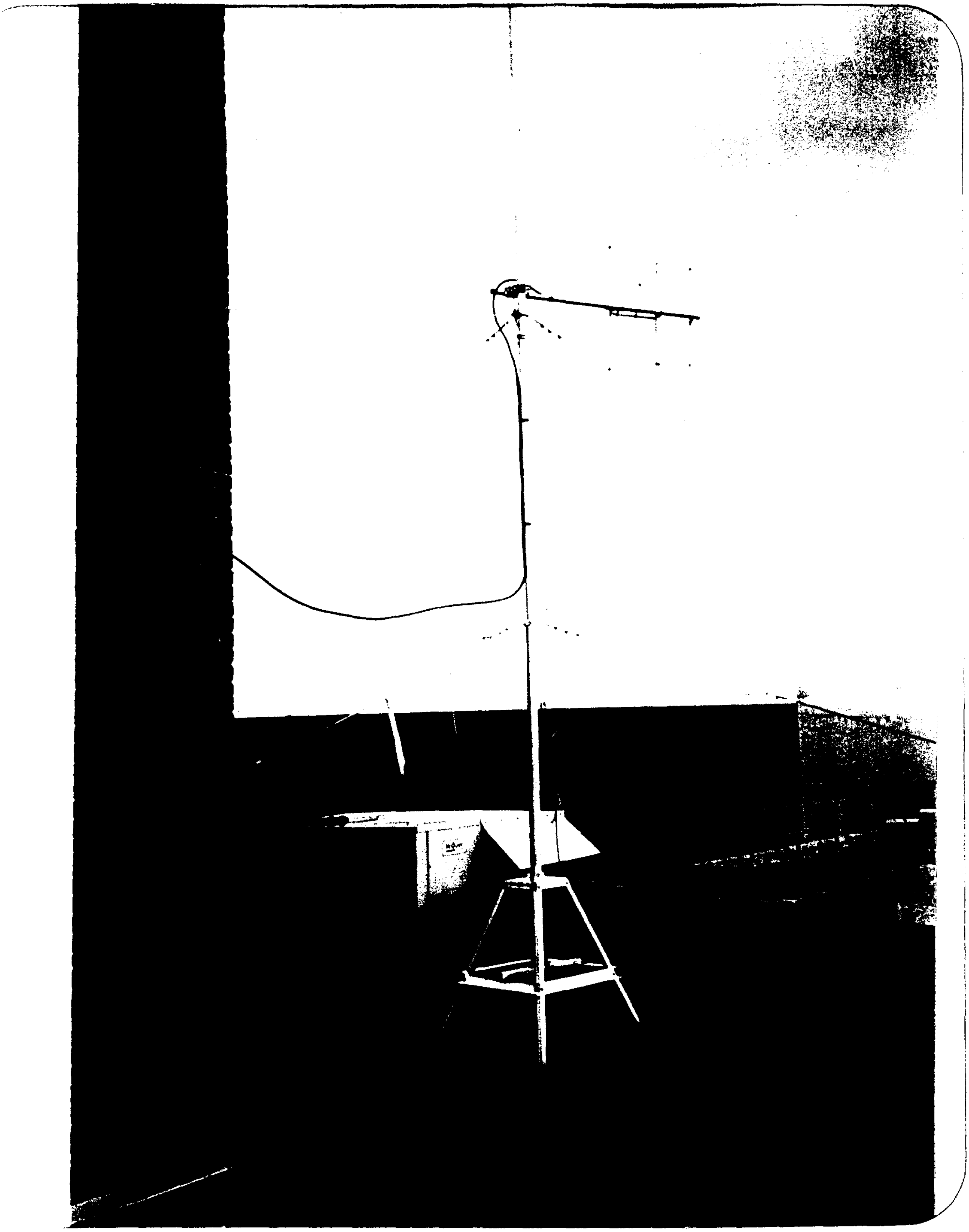
NIPPON TELEGRAPH AND TELEPHONE CORPORATION

FEBRUARY 6-10, 1995

NTT

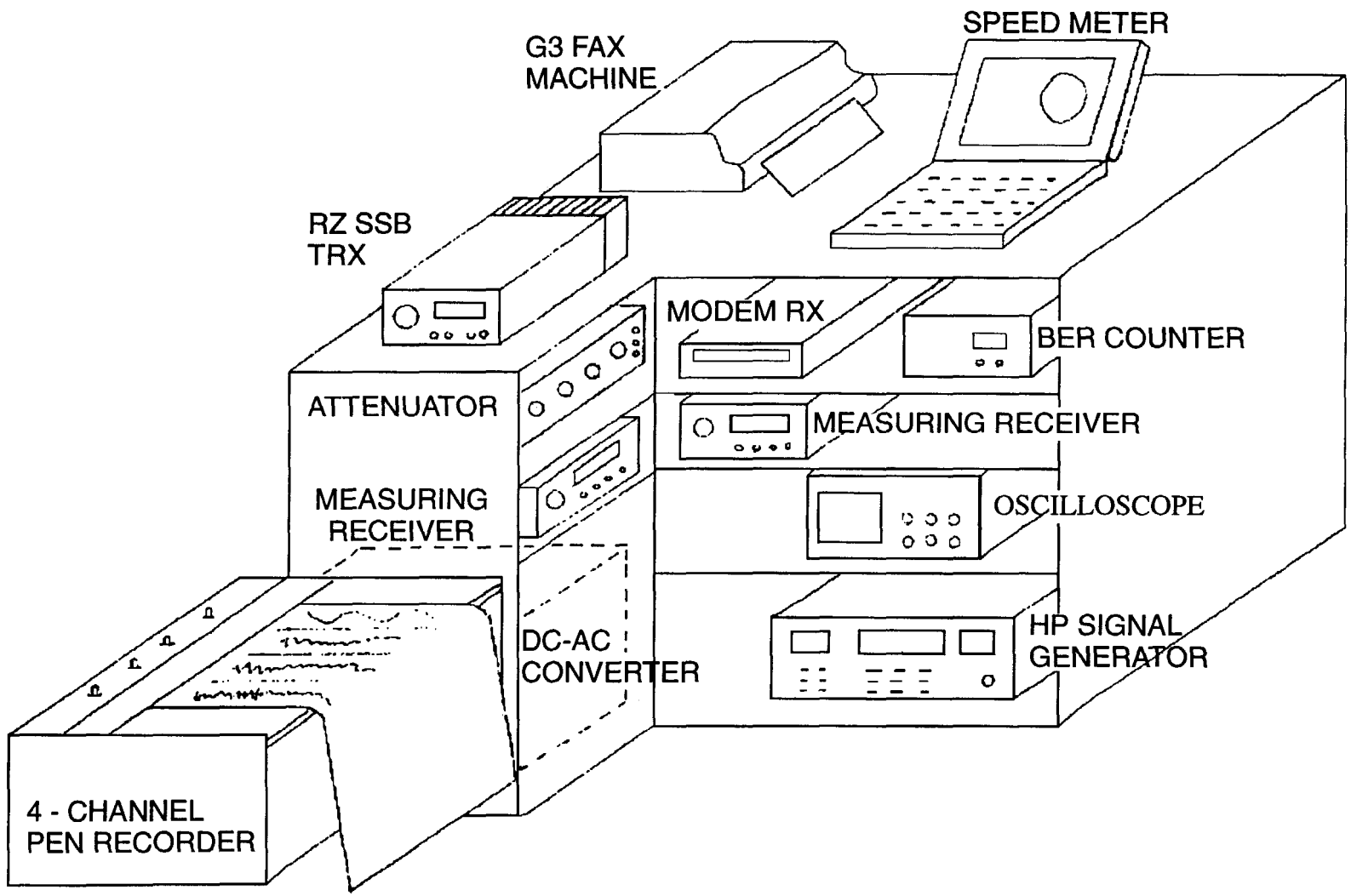
Base and Mobile Station

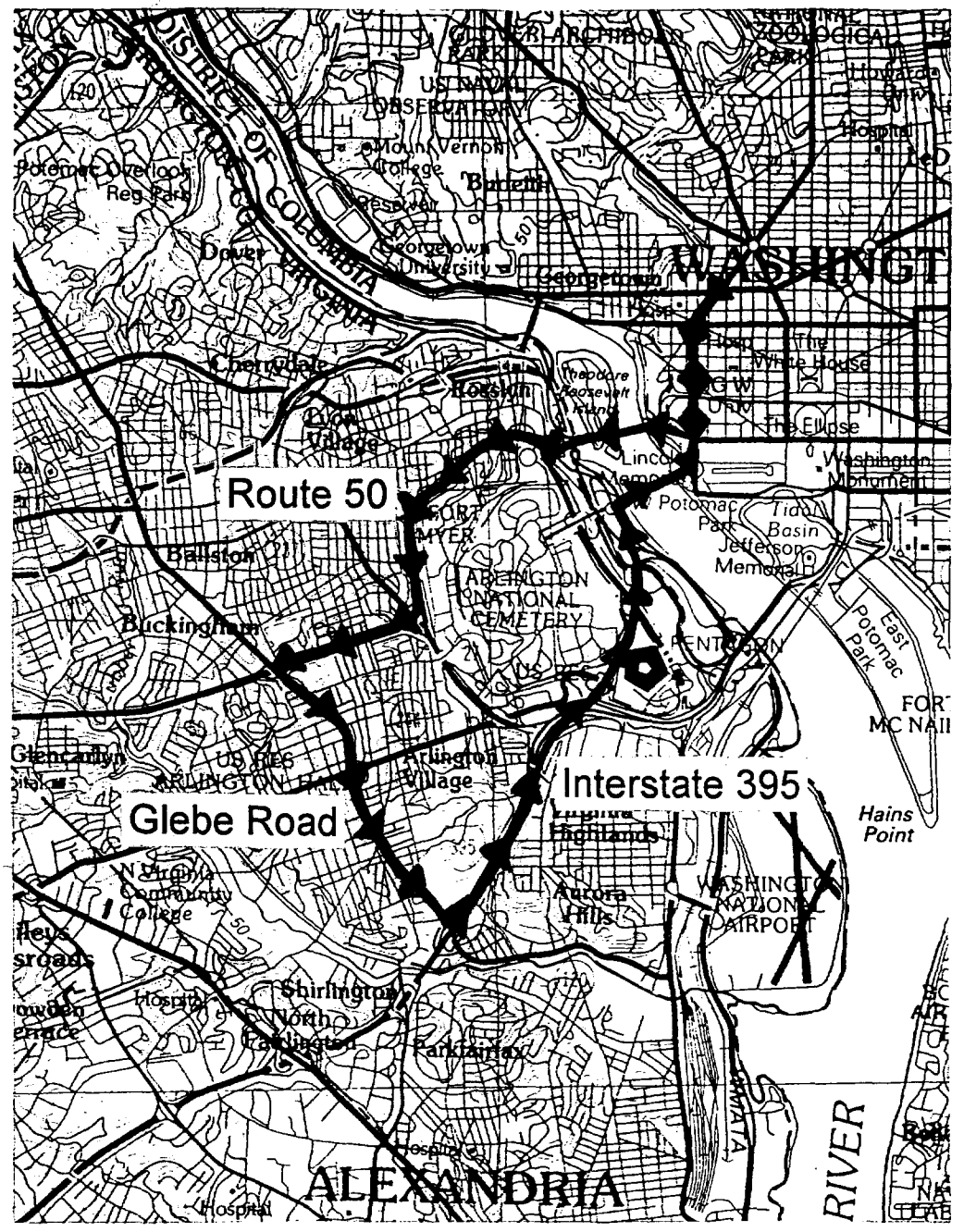




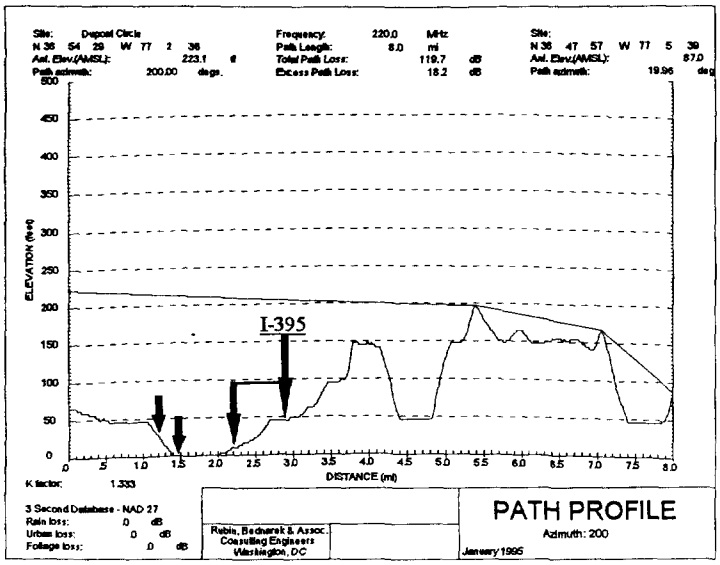

1350
RAM 350

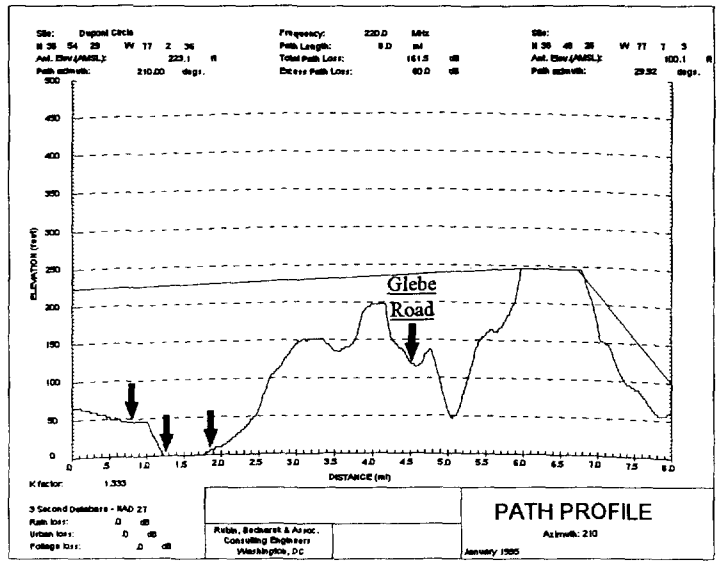
Setup Inside Mobile Station

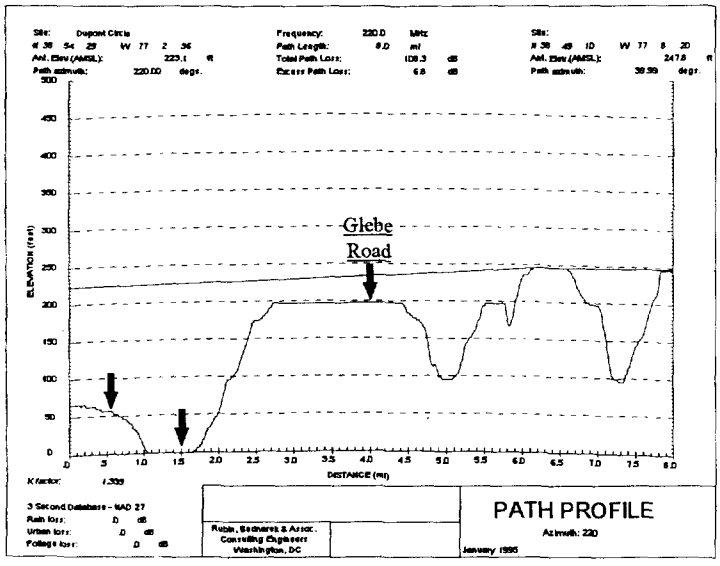




Demonstration Route


I-395
DISTANCE (mi)
PATH PROFILE
Azimuth: 200
January 1995


Glebe
Road
DISTANCE (mi)
PATH PROFILE
January 1995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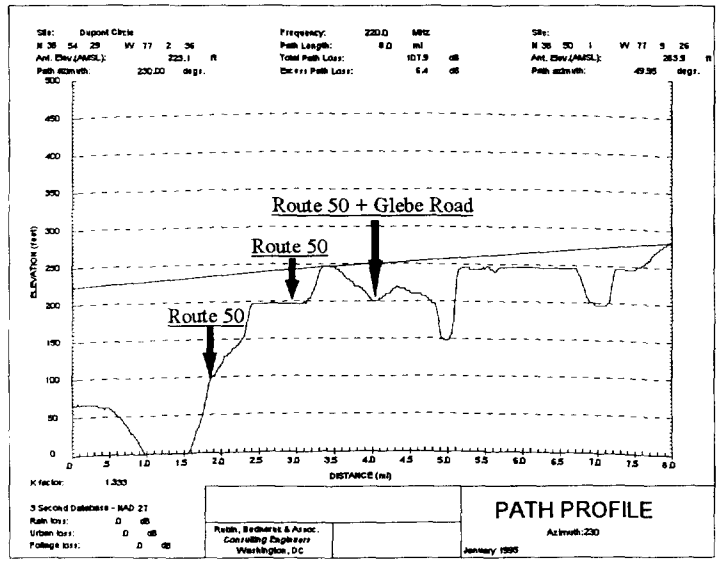
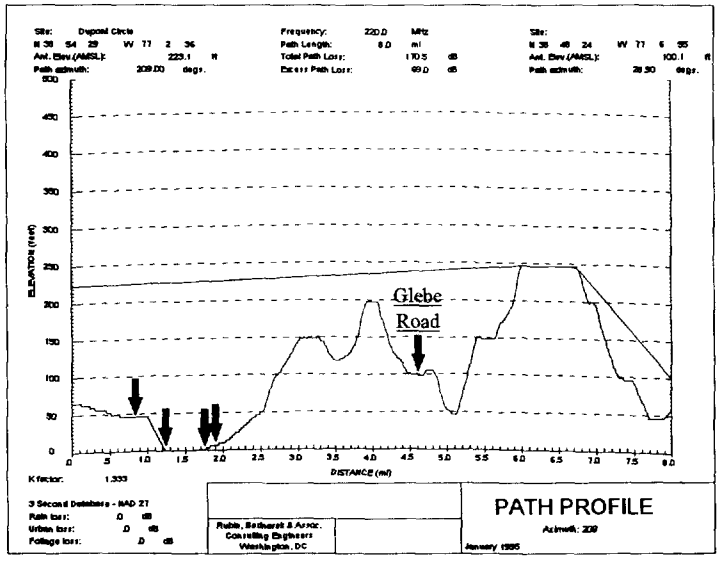
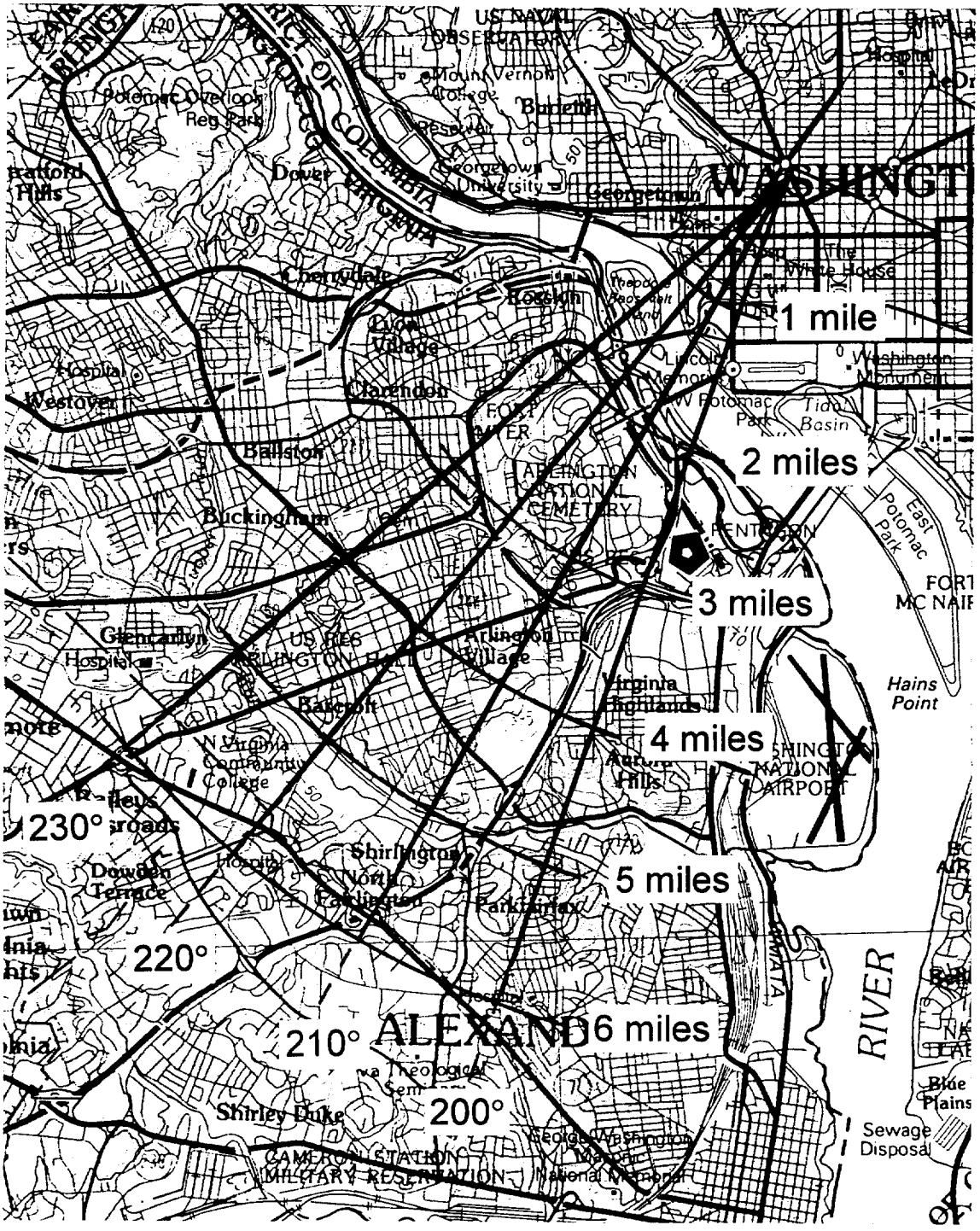
PATH PROFILE
January 1995


Route 50 + Glebe Road
Route 50
Route 50
DISTANCE (mi)
PATH PROFILE
January 1995


Glebe
Road
DISTANCE (mi)
PATH PROFILE
January 1995

Terrain


1 mile
2 miles
3 miles
4 miles
5 miles
6 miles
230°
220°
210°
200°
Potomac Overlook Reg Park
Mount Vernon College
Burleith
Georgetown University
Georgetown
Cherrydale
Lyon Village
Hospital
Westover
Clarendon
Ballston
Buckingham
Glencarlyn
Hospital
Arlington Village
Bakerloft
N Virginia Community College
Virginia Highlands
Hains Point
Shirlington
Parkington
Douglas Terrace
Shirley Duke
CAMERON STATION MILITARY RESERVATION
Blue Plains
Sewage Disposal
East Potomac Park
Tidal Basin
Lincoln Memorial
Washington Monument
The White House
PENTAGON
RIVER

Demonstration

- **Analog Voice**
- **9.6 kbps Data**
- **G3 Facsimile at 9.6 kbps**

Contacts

Jeffrey Olson, Paul Kollmer, or Diane Gaylor

Paul, Weiss, Rifkind, Wharton & Garrison

202-223-7300

Steve Crowley, Philip Rubin, or Robert Bednarek

Rubin, Bednarek & Associates

202-296-9380

C

RZ® SSB Technology in Brief

NTT

Introduction to RZ® SSB

RZ® SSB is a new radio technology developed by NTT that can be used to transmit and receive analog voice, digital voice, and high speed data signals having an information bandwidth up to 3.4 kHz in a 5 kHz channel and in a land mobile radio environment. Its high performance for all three signal types has been proven in extensive laboratory and field tests. Equipment employing the technology can be widely available in commercial quantities in the near future at prices competitive with existing systems. Thus, RZ® SSB responds ideally to the FCC's efforts to employ more spectrum-efficient techniques, particularly on private land mobile radio frequencies.

Features of RZ® SSB

Channel Spacing	5 kHz
Information Signal Bandwidth	300 Hz - 3.4 kHz
Illustrative Transmittable Signals	• Voice/Encrypted Voice • G3 Facsimile • Voice-Band Modem
Maximum Speed Handling Capability of G3 Facsimile	9.6 kbps
Maximum Data Handling Capability (Tested)	19.2 kbps
Maximum Spectrum Efficiency (Digital)	3.84 bits/Hz (=19.2 kbps/5.0 kHz)
Illustrative Channel Usage	FDMA(SCPC),TDD,TDMA
Analog Voice Quality	Superior to 12.5 kHz FM
Illustrative Voice Coders	Vocoder, VSELP, PSI-CELP, etc.
Degradations Due To Mistuned Carrier	None
Immunity To Fading And Interference	Strong
Cost Compared To Existing Equipment	Same

RZ® SSB Technology in Brief

RZ® SSB is an acronym for "Real Zero Single Side-Band." The technology is based on the concept that the zero crossings of the RZ® SSB signal can carry information signals without any loss.[1/]

The RZ® SSB technology combines two established technologies: single side-band amplitude modulation transmission and phase modulation reception. The former provides a narrowband signal and the latter provides resistance against noise, fading, and interference.

The RZ® SSB technology provides further resistance against fading by employing two-branch diversity reception with equal gain combining. Random FM noise cancelers are used in each branch. However, diversity reception is not required in non-mobile environments or for relatively slow speeds (such as walking and slow vehicular speeds).

Narrowband radio technologies inherently suffer from amplitude linearity and frequency stability problems. RZ® SSB reduces the problem of amplitude linearity by employing a Cartesian feedback technique. It diminishes the problem of frequency stability by using a digital TCXO.

Analog Large Scale Integrated (LSI) circuits are employed in the RZ® SSB transceiver to reduce transceiver size and power consumption.

RZ® SSB can accommodate in a 5 kHz channel an information signal having a bandwidth identical to the conventional telephone bandwidth (300 Hz ~ 3.4 kHz), allowing RZ® SSB equipment to seamlessly interface with signals coming from the conventional telephone lines without any additional equipment.

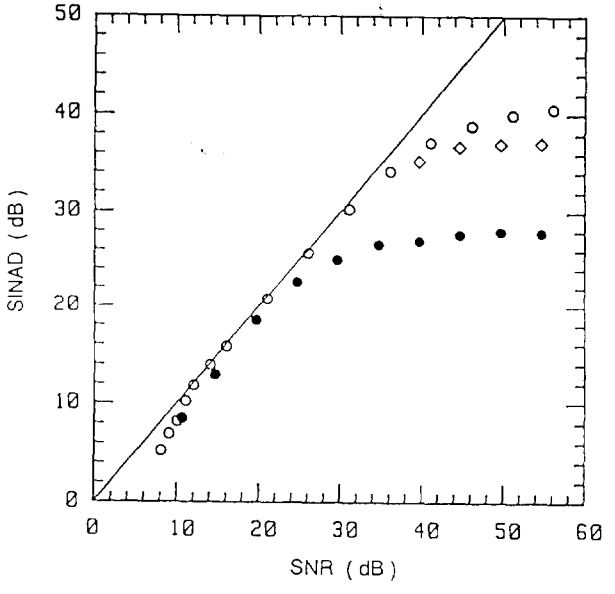
When used with a relatively low bit rate coder such as PSI-CELP, Time Division Duplexing (TDD) can be employed to achieve duplex operation in a single 5 kHz channel.

1/ The basic concept was mathematically demonstrated by Dr. Benjamin F. Logan of Bell Laboratories in 1977 (BSTJ, 56, 4, p. 487, 1977). However, Dr. Logan did not solve the practical problem of how to extract information signals from zero-crossings. RZ® SSB is the first practical solution to this problem.

Performance of RZ® SSB

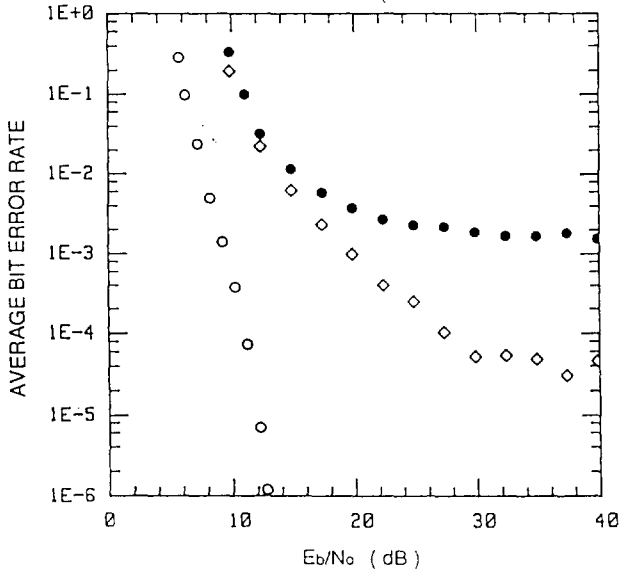
The following graphs illustrate the results of laboratory tests of an RZ® SSB system conducted using a 5 kHz channel at a center frequency in the 220 MHz band without fading and with simulated 20 Hz and 70 Hz Rayleigh fading.

- SINAD vs. SNR for a 1 kHz Tone



○ : NON - RAYLEIGH FADING
◇ : 20 Hz RAYLEIGH FADING, WITH DIVERSITY (RF = 221 MHz , V = 61 mph)
● : 70 Hz RAYLEIGH FADING, WITH DIVERSITY (RF = 850 MHz , V = 55 mph)

- Average BER vs. E_b/N_o for a 9.6 kbps 16-QAM Voice-Band Modem Signal



○ : NON - RAYLEIGH FADING
◇ : 20 Hz RAYLEIGH FADING, WITH DIVERSITY (RF = 221 MHz , V = 61 mph)
● : 70 Hz RAYLEIGH FADING, WITH DIVERSITY (RF = 850 MHz , V = 55 mph)

The Demonstration

To demonstrate the capabilities of RZ® SSB technology, a base station featuring an RZ® SSB transmitter and a 3 element Yagi antenna has been installed on the roof of 1350 Connecticut Ave, and a Dodge Ram van has been fitted with whip antennas and an RZ® SSB receiver. The transmitting antenna will transmit various test signals in a 5 kHz channel at a center frequency of 220.9825 MHz. The test signals will be received in the van as it travels around the Washington, D.C. area at various speeds. Participants riding in the van will observe performance of the following tests:

- An analog voice signal will be transmitted from the base station and received at the van. A four-pen chart recorder installed in the van will record:

  - the instantaneous signal level received at each of the two receiving antennas,

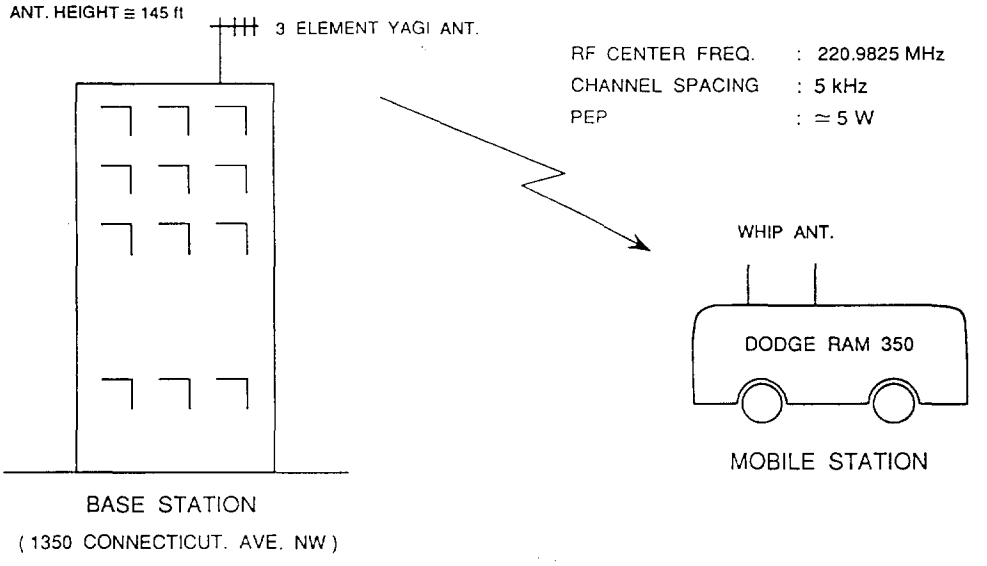
  - the median value for one antenna, and

  - the speed of the van.

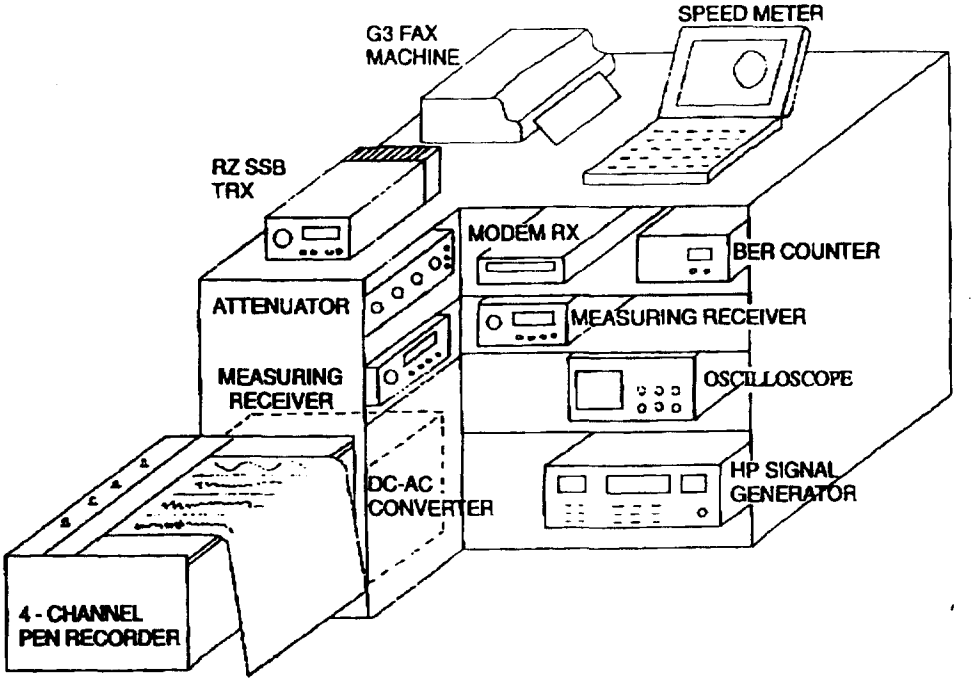
- A 9.6 kbps G3 facsimile will be transmitted from the base station and received at a facsimile machine installed in the van.

- A 9.6 kbps with 16-QAM data signal will be transmitted from the base station and received at the van. The quality of the received signal will be analyzed using a bit error rate counter installed in the van.

- Base and Mobile Station



- Setup Inside Mobile Station



D

RZ SSB FOR APCO PROJECT 25

NIPPON TELEGRAPH AND TELEPHONE CORPORATION

JANUARY, 1995

OCTOBER, 1994

NTT